## CLAIMS:

- 1. A method of detecting a clonal population of cells in a biological sample, which clonal cells are characterised by a diagnostically distinctive nucleic acid region, said method comprising co-localising the subject nucleic acid regions derived from said sample, which co-localisation is based on nucleotide sequence identity, and qualitatively and/or quantitatively detecting the levels of said co-localised nucleic acid regions wherein a higher level of a co-localised nucleic acid region population relative to background levels is indicative of the presence of a clonal population of cells in said sample.
- 2. A method for diagnosing and/or monitoring a clonal population of cells in a mammal, which clonal cells are characterised by a diagnostically distinctive nucleic acid region, said method comprising co-localising the subject nucleic acid regions derived from a biological sample derived from said mammal, which co-localisation is based on nucleotide sequence identity, and qualitatively and/or quantitatively detecting the levels of said co-localised nucleic acid regions wherein a higher level of a co-localised nucleic acid region population relative to background levels is indicative of the presence of a clonal population of cells in said sample.
- 3. The method according to claim 1 or 2 wherein said clonal population of cells is a neoplastic clonal population.
- 4. The method according to claim 3 wherein said neoplastic population of cells corresponds to a leukaemia, lymphoma or myeloma.
- 5. The method according to claim 4 wherein said leukaemia is actue myeloid leukaemia or acute lymphoblastic leukaemia.
- 6. The method according to claim 1 or 2 wherein said clonal population of cells is a non-neoplastic clonal population of cells.

WO 2004/044209 PCT/AU2003/001497

- 46 -

- The method according to claim 6 wherein said non-neoplastic population of cells corresponds to a myelodysplasia, polycythaemia vera or a myeloproliferative syndrome.
- 8. The method according to claim 3 or 6 wherein said clonal population of cells is a clonal immune cell population.
- 9. The method according to claim 8 wherein said immune cell is a T cell or a B cell.
- 10. The method according to claim 1 or 2 wherein said clonal population of cells is a clonal microorganism population.
- 11. The method according to any one of claims 1-10 wherein said nucleic acid region is a DNA region.
- 12. The method according to claim 11 wherein said diagnostically distinctive DNA region is mitochondrial DNA or a microsatellite.
- 13. The method according to claim 12, wherein said mitochondrial DNA is mitochondrial D loop DNA.
- 14. The method according to claim 5 wherein said nucleic acid region is a DNA region and said diagnostically distinctive DNA region is mitochondrial D loop DNA.
- 15. The method according to any one of claims 1-14 wherein said co-localisation is achieved utilising any one of the techniques of:
  - (i) Denaturing gradient electrophoresis.
  - (ii) Temperature gradient denaturing electrophoresis
  - (iii) Constant denaturing electrophoresis

- (iv) Single strand conformational electrophoresis
- (v) Denaturing high performance liquid chromatography
- (vi) Microassays
- (vii) Mass spectrometry
- 16. The method according to claim 14 wherein said co-localisation is achieved utilising denaturing gel or capillary electrophoresis.
- 17. A method for diagnosing and/or monitoring a mammalian disease condition characterised by the presence of a clonal population of cells, which clonal cells are characterised by a diagnostically distinctive nucleic acid region, said method comprising co-localising the subject nucleic acid regions derived from a biological sample derived from said mammal, which co-localisation is based on nucleotide sequence identity and qualitatively and/or quantitatively detecting the levels of said co-localised nucleic acid regions wherein a higher level of the co-localised nucleic acid region population relative to background levels is indicative of the presence of a clonal population of cells in said sample.
- 18. The method according to claim 17 wherein said clonal population of cells is a neoplastic clonal population.
- 19. The method according to claim 18 wherein said disease condition is leukaemia, lymphoma or myeloma.
- 20. The method according to claim 19 wherein said leukaemia is actue myeloid leukaemia or acute lymphoblastic leukaemia.
- 21. The method according to claim 17 wherein said clonal population of cells is a non-neoplastic clonal population of cells.

WO 2004/044209 PCT/AU2003/001497

- 48 -

- 22. The method according to claim 21 wherein said disease condition is myelodysplasia, polycythaemia vera or a myeloproliferative syndrome.
- 23. The method according to claim 18 or 21 wherein said clonal population of cells is a clonal immune cell population.
- 24. The method according to claim 23 wherein said immune cell is a T cell or a B cell.
- 25. The method according to claim 17 wherein said clonal population of cells is a clonal microorganism population.
- 26. The method according to any one of claims 17-25 wherein said nucleic acid region is a DNA region.
- 27. The method according to claim 26 wherein said diagnostically distinctive DNA region is mitochondrial DNA or a microsatellite.
- 28. The method according to claim 27, wherein said mitochondrial DNA is mitochondrial D loop DNA.
- 29. The method according to claim 20 wherein said nucleic acid region is a DNA region and said diagnostically distinctive DNA region is mitochondrial D loop DNA.
- 30. The method according to any one of claims 17-29 wherein said co-localisation is achieved utilising any one of the techniques of:
  - (i) Denaturing gradient electrophoresis.
  - (ii) Temperature gradient denaturing electrophoresis
  - (iii) Constant denaturing electrophoresis
  - (iv) Single strand conformational electrophoresis

- 49 -

- (v) Denaturing high performance liquid chromatography
- (vi) Microassays
- (vii) Mass spectrometry
- 31. The method according to claim 30 wherein said co-localisation is achieved utilising denaturing gel or capillary electrophoresis.